



The Consultative Committee for Space Data Systems

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**Draft Recommendation for  
Space Data System Practices**

**SPACECRAFT ONBOARD  
INTERFACE SERVICES—  
SUBNETWORK TEST  
SERVICE**

**DRAFT RECOMMENDED PRACTICE**

**CCSDS 855.0-R-1**

**RED BOOK**

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## FOREWORD

### (WHEN THIS RECOMMENDED PRACTICE IS FINALIZED, IT WILL CONTAIN THE FOLLOWING FOREWORD:)

This document is a technical **Recommended Practice** for use in developing flight and ground systems for space missions and has been prepared by the **Consultative Committee for Space Data Systems** (CCSDS). The *Subnetwork Test Service* described herein is intended for missions that are cross-supported between Agencies of the CCSDS, in the framework of the Spacecraft Onboard Interface Services (SOIS) CCSDS area.

This **Recommended Practice** specifies a service to be used by space missions to test communications functionality of the node subnetwork interface and to test connectivity within the subnetwork. The SOIS Subnetwork Test Service is a simple service which is provided by data link-specific mechanisms within the subnetwork layers. The service interface is only present in the data system invoking the service. The SOIS Subnetwork Test Service provides a common service interface regardless of the particular type of data link being used for communication.

Through the process of normal evolution, it is expected that expansion, deletion, or modification of this document may occur. This Recommended Practice is therefore subject to CCSDS document management and change control procedures, which are defined in the *Procedures Manual for the Consultative Committee for Space Data Systems*. Current versions of CCSDS documents are maintained at the CCSDS Web site:

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## PREFACE

This document is a draft CCSDS Recommended Practice. Its draft status indicates that the CCSDS believes the document to be technically mature and has released it for formal review by appropriate technical organizations. As such, its technical contents are not stable, and several iterations of it may occur in response to comments received during the review process.

Implementers are cautioned **not** to fabricate any final equipment in accordance with this document's technical content.

## DOCUMENT CONTROL

Document	Title	Date	Status
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## **1 INTRODUCTION**

### **1.1 PURPOSE AND SCOPE OF THIS DOCUMENT**

This document comprises an output of the Spacecraft Onboard Interface Services (SOIS) Area of the Consultative Committee for Space Data Systems. It is one of a family of documents specifying the SOIS-compliant services to be provided by onboard subnetworks.

The purpose of this document is to define services and service interfaces provided by the SOIS Subnetwork Test Service. Its scope is to specify the service only and not to specify methods of providing the service over a variety of onboard data links.

### **1.2 APPLICABILITY**

This document applies to any mission or equipment claiming to provide a CCSDS SOIS-compliant Subnetwork Test Service.

### **1.3 RATIONALE**

SOIS provide service interface specifications in order to promote interoperability and development reuse via peer-to-peer and vertical standardisation.

### **1.4 DOCUMENT STRUCTURE**

The document has five major sections:

- this section, containing administrative information, definitions and references;
- section 2, describing general concepts and assumptions;
- section 3, containing the Subnetwork Test Service specification;
- section 4, containing the Management Information Base (MIB) for the service;
- section 5, comprising a Service Conformance Statement Proforma.

In addition, annex A contains informative references.

### **1.5 CONVENTIONS AND DEFINITIONS**

#### **1.5.1 BIT NUMBERING CONVENTION AND NOMENCLATURE**

In accordance with modern data communications practice, spacecraft data fields are often grouped into eight-bit ‘words’ widely known as bytes. Throughout this Recommended Practice, such an eight-bit word is called an ‘octet’. The numbering for octets within a data structure starts with zero.

By CCSDS convention, any ‘spare’ bits shall be permanently set to ‘0’.

## 1.5.2 DEFINITIONS

### 1.5.2.1 General

Within the context of this document the following definitions apply.

### 1.5.2.2 Definitions from the Open Systems Interconnection (OSI) Basic Reference Model

This document is defined using the style established by the Open Systems Interconnection (OSI) Basic Reference Model (reference [1]). This model provides a common framework for the development of standards in the field of systems interconnection.

The following terms, used in this Recommended Practice, are adapted from definitions given in reference [2]:

**Layer:** A subdivision of the architecture, constituted by subsystems of the same rank.

**Protocol Data Unit (PDU):** A unit of data specified in a protocol and consisting of protocol-control information and possibly user data.

**Service:** A capability of a layer (service provider) together with the layers beneath it, which is provided to the service users.

**Service Data Unit (SDU):** An amount of information whose identity is preserved when transferred between peer entities in a given layer and which is not interpreted by the supporting entities in that layer.

### 1.5.2.3 Terms Defined in this Recommended Practice

For the purposes of this Recommended Practice, the following definitions also apply. Many other terms that pertain to specific items are defined in the appropriate sections.

**Channel:** An identifier for network resources associated with a resource reservation. May be a list of time slots in a time division multiplexed system or a bandwidth limit in a bandwidth division multiplexed system. The subnetwork resources required for the communication may also be defined to allow simultaneous use of non-conflicting resources on subnetworks that support this feature.

**Octet:** An eight-bit word commonly referred to as a byte.

**Priority:** The transmit precedence of an SDU relative to other SDUs.

**Quality of Service (QoS):** The ability of a communication system to provide predictable and differentiated services. Quality of Service for a communication service may be characterised in terms of important features relevant to that communications service, for example: Reliability, Transmission rate, Effective Bandwidth and latency, Error rate.

**Service Access Point (SAP):** Within the subnetwork, a SOIS Subnetwork Service Access Point. As a minimum it locates a data system and a subnetwork user entity within that data system.

## 1.6 HOW THIS DOCUMENT FITS INTO THE SOIS DOCUMENTATION TREE

This document conforms to the principles set out in the Spacecraft Onboard Interface Services Green Book (reference [A1]) and should not be applied without first consulting this reference. The protocols which provide this service are to be documented for individual links, and this may be in the purview of individual missions, agencies or of CCSDS depending on future circumstance.

## 1.7 DOCUMENT NOMENCLATURE

The following conventions apply throughout this Recommended Practice:

- a) The words 'shall' and 'must' imply a binding and verifiable specification;
- b) The word 'should' implies an optional, but desirable, specification;
- c) The word 'may' implies an optional specification;
- d) The words 'is', 'are', and 'will' imply statements of fact.

## 1.8 REFERENCES

The following documents contain provisions which, through reference in this text, constitute provisions of this Recommended Practice. At the time of publication, the editions indicated were valid. All documents are subject to revision, and users of this Recommended Practice are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. The CCSDS Secretariat maintains a register of currently valid CCSDS Documents.

- [1] *Information Technology—Open Systems Interconnection—Basic Reference Model: The Basic Model*. International Standard, ISO/IEC 7498-1:1994. 2nd ed. Geneva: ISO, 1994.
- [2] *Information Technology—Open Systems Interconnection—Basic Reference Model—Conventions for the Definition of OSI Services*. International Standard, ISO/IEC 10731:1994. Geneva: ISO, 1994.
- [3] *Space Link Identifiers*. Recommendation for Space Data System Standards, CCSDS 135.0-B-3. Blue Book. Issue 3. Washington, D.C.: CCSDS, October 2006.

NOTE – Informative references are contained in annex A.

## 2 OVERVIEW

### 2.1 FUNCTION

The SOIS Subnetwork Test Service provides a means for a user entity to test data system functionality and connectivity of the subnetwork.

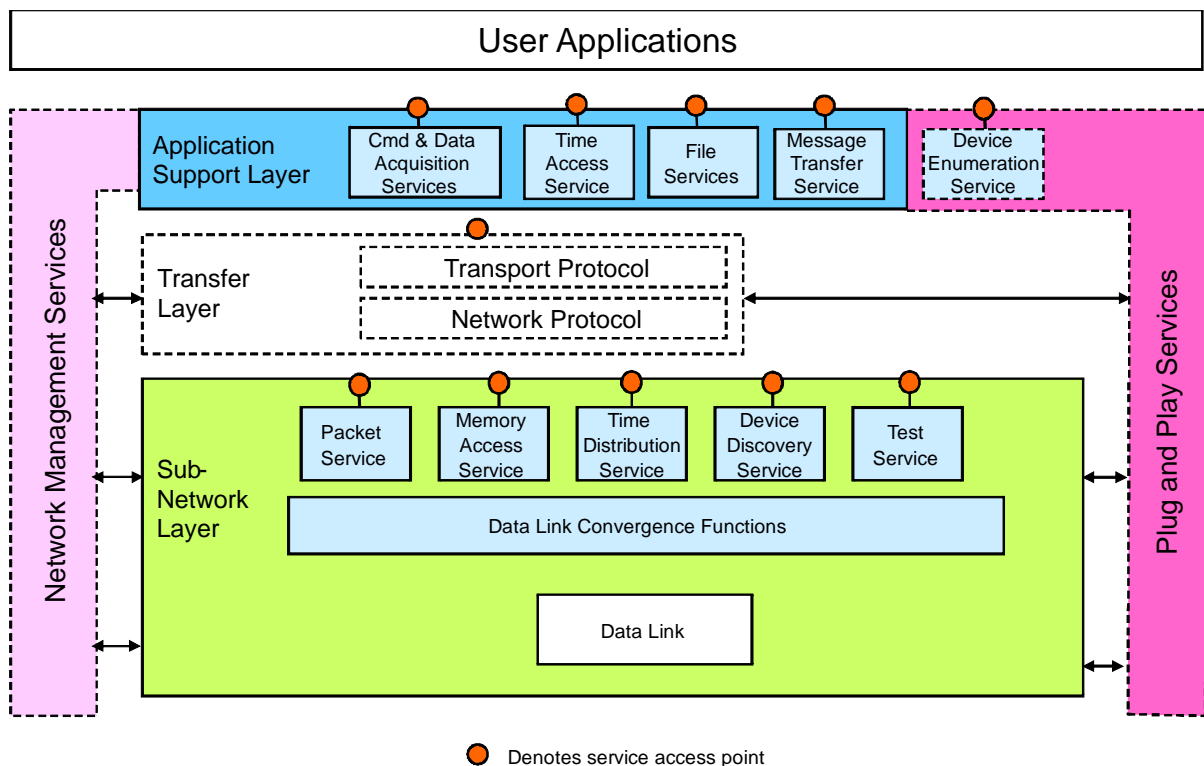
### 2.2 CONTEXT

The SOIS Subnetwork Layer provides the Test Service to user applications. The service may be provided over a variety of data links and the method of such provision is not in the scope of this document.

As shown in figure 2-1, the service is one of a number of services which may be provided by the SOIS Subnetwork.

The Subnetwork Test Service makes use of the data link to transfer data and control information. A variety of data links may be suited to provision of the service and the strategy for such service provision is outlined in reference **Error! Reference source not found.**

The Test Service is provided to the application entity invoking the service only. The method of testing is data-link specific.



**Figure 2-1: Subnetwork Test Service Context**

## **2.3 ASSUMPTIONS**

The following assumptions have been made in designing the SOIS Subnetwork Test Service:

- The SOIS Subnetwork Test Service is provided across single subnetworks.
- The SOIS Subnetwork Test Service is made available to protocol entities in the Transfer, Application Support, and User Application Layers.

## **2.4 QUALITY OF SERVICE**

The Test Service operates with a single, best-effort Quality of Service. This service makes a single attempt to provide the requested service but cannot ensure that it will be completed successfully.

Channel and Priority parameters are not provided in the Test Service. Were a subnetwork to provide channelisation and prioritisation to users of other subnetwork services, it would fall to the subnetwork Management Information Base (MIB) to set default channel and priority levels to ensure that the Test Service adhere to an overall subnetwork prioritisation and resource reservation scheme.

### **3 SUBNETWORK TEST SERVICE**

#### **3.1 SERVICE PARAMETERS**

The parameters of the Subnetwork Test Service are defined below:

##### **Source Subnetwork Service Access Point (SSNSAP)**

The SSNSAP identifies the SAP that locates the user entity that wishes to invoke the Test Service.

##### **Destination Address**

The Destination Address is the subnetwork address of the data system whose status is to be verified. A Destination Address identical to the subnetwork address of the data system hosting the SSNSAP indicates that the subnetwork interface and subnetwork functionality local to the invoking application entity is to be verified. Reserved Destination Address values are controlled by reference [3].

##### **Test Status**

Test Status indicates the results of the test. The Test Service is intended to be used for checking data system functionality and connectivity of the subnetwork. The service is used to check operation of the subnetwork aspects of the local data system as well as subnetwork connectivity to other data systems. The status parameter may be dependent on the inherent capabilities of the Data Link layer protocol. As a minimum the service should return a go/no-go status, but this may be augmented by error codes, bit rate selection, prime/redundant media active, etc. The service does not indicate the correct operation of other subnetwork services but allows for the reporting of subnetwork-specific status.

#### **3.2 TEST SERVICE PRIMITIVES**

##### **3.2.1 GENERAL**

In this subsection the service primitives for the SOIS Subnetwork Test Service are presented.

There are two primitives used by this service:

- TEST.request which requests that a verification be performed;
- TEST.indication which returns the results of the verification.

### **3.2.2 TEST.REQUEST**

#### **3.2.2.1 Function**

The **TEST.request** primitive requests the service to perform a verification of subnetwork functionality.

#### **3.2.2.2 Semantics**

**TEST.request** (SSNSAP, Destination Address)

#### **3.2.2.3 When Generated**

The **TEST.request** primitive shall be passed to the SOIS Subnetwork Test Service provider to request that a verification be performed.

#### **3.2.2.4 Effect on Receipt**

Receipt of the **TEST.request** primitive shall cause the SOIS Subnetwork service provider to perform the verification.

#### **3.2.2.5 Additional Comments**

SSNSAP identifies the invoking user entity.

Destination Address identifies the data system whose status is to be established. If the destination is identical to the source then status of the local subnetwork interface is requested.

### **3.2.3 TEST.INDICATION**

#### **3.2.3.1 Function**

The **TEST.indication** is used to pass the results of the verification to the user entity.

#### **3.2.3.2 Semantics**

**TEST.indication** (SSNSAP, Destination Address, Test Status)

#### **3.2.3.3 When Generated**

This primitive is issued by the service provider to the receiving application on receipt of subnetwork information pertaining to a verification.

#### **3.2.3.4 Effect on Receipt**

The response of the user entity to a **TEST.indication** primitive is unspecified.

#### **3.2.3.5 Additional Comments**

SSNSAP identifies the invoking user entity.

Destination Address identifies the data system for which status was to be established. If the source is identical to the destination then status of the local subnetwork interface was requested.

Test Status indicates the results of the verification.



## **4 MANAGEMENT INFORMATION BASE**

There is currently no Management Information Base associated with this service. All management items are associated with the protocol providing the service. Any protocol claiming to provide this service in a SOIS-compliant manner shall publish its Management Information Base as part of the protocol specification.

## 5 SERVICE CONFORMANCE STATEMENT PROFORMA

It is mandatory that, for any protocol implementation claiming to provide this service, this proforma be completed giving details of the capabilities of the implementation.

<b>Service Conformance Statement SOIS Subnetwork Test Service</b>
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### Implementation Information

Implementer Identification	
Implementation Identification	
Version	
Underlying Data Link	
Protocol Identifier	

### Mandatory Features

TEST.request	√
TEST.indication	√

### Additional Information

Indicate Supported Test Status Values	
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## ANNEX A

### INFORMATIVE REFERENCES

- [A1] *Spacecraft Onboard Interface Services*. Report Concerning Space Data System Standards, CCSDS 850.0-G-1. Green Book. Issue 1. Washington, D.C.: CCSDS, June 2007.

NOTE – Normative references are listed in 1.8.